

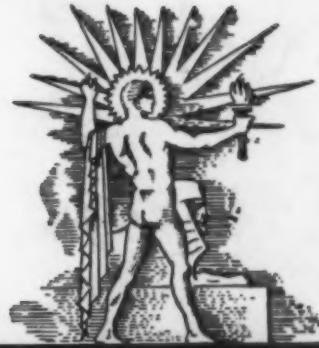
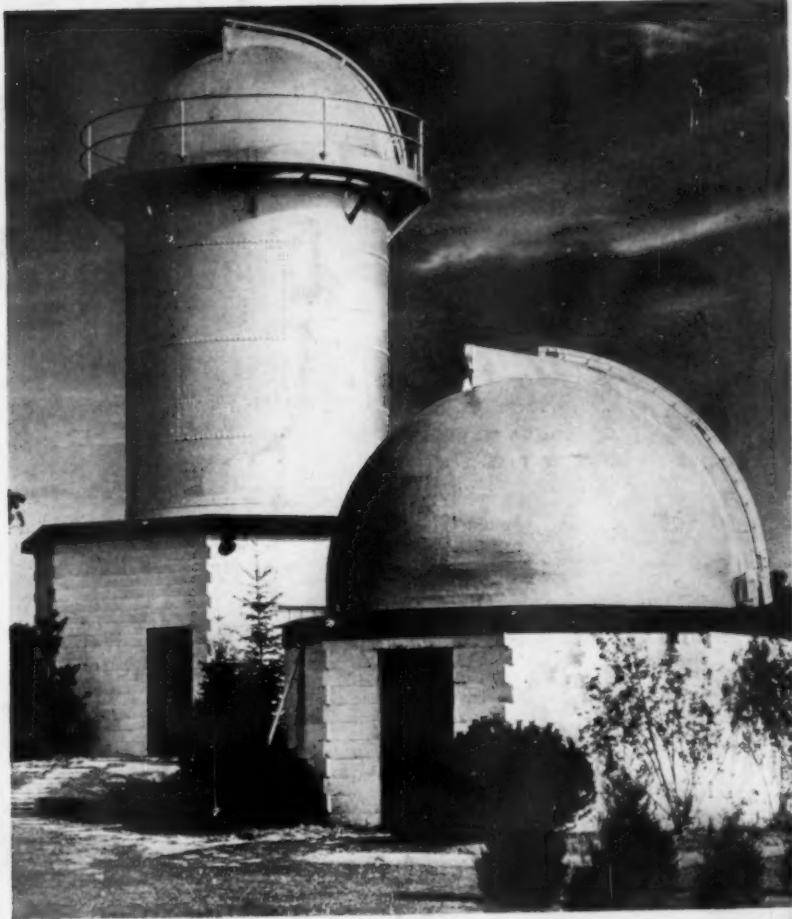
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SCIENCE NEWS LETTER

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THE WEEKLY SUMMARY OF CURRENT SCIENCE.



August 21, 1937

Robot Joshua

See Page 122

A SCIENCE SERVICE PUBLICATION

SCIENCE NEWS LETTER

Vol. XXXII



The Weekly

No. 854

Summary of

Current Science

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Edited by WATSON DAVIS

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DO YOU KNOW?

British bulldogs were famous even in Roman days.

A mammoth's tooth was recently dug up at Oxford, England.

A new dye made in Hungary can be applied to window panes to keep out ultraviolet rays.

Experiments in cooling railroad cars with a mixture of ice and dry ice have been made in Hungary.

Wireless transmission of pictures across the Pacific has been successful in various trials, between Japan and San Francisco.

Dental science is being taught at Columbia University as a cultural course to students in anthropology.

To test corrosion of steel exposed to weather, engineers put steel plates outdoors in Maryland 20 years ago and are still inspecting them.

According to a treaty with Mexico, America's migratory song birds, such as mockingbirds, finches, and buntings, cannot legally be sold as cage birds except to zoos and other scientific institutions.

Not many wild animals live out their natural lives and die of old age.

When iron was new in old Egypt, it was rare and was valued as material for rings and other jewelry.

A chemical that gives a good scent imitation of a skunk is used as a fire warning in some mines.

The earliest evidence of wine made in Greece consists of wine jars 4,000 years old, and still containing grape seed.

Churning butter is a familiar process, but chemists are still somewhat puzzled as to exactly what chemical changes take place.

There is no convincing evidence that great floods are more frequent now than hundreds of years ago, says an army engineer.

Beheading shrimps has revolutionized the shipping of this popular sea food to distant markets; because headless shrimp weigh much less in shipment.

A British physicist states that street noises were worse in Victorian London than nowadays, but houses then were more solid and therefore more quiet.

WITH THE SCIENCES THIS WEEK

Most articles are based on communications to Science Service or papers before meetings, but where published sources are used they are referred to in the article.

ANIMAL PSYCHOLOGY

Are fish colorblind? p. 116.

ANTHROPOLOGY

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ARCHAEOLOGY

Were rattles ever used by adults? p. 121.

ASTRONOMY

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How large is a sunspot sometimes? p. 115.

How many tails has Finsler's comet? p. 121.

BIOLOGY

Are one-celled animals of two sexes? p. 125.

What chemical can cause plant cancer? p. 117.

CHEMISTRY

By what process can wool be made unshrinkable? p. 118.

From what waste material can the Japanese make rayon? p. 120.

Why was the water from the fountain of Peirene at Corinth of such value to the ancient Greeks? p. 127.

CHEMISTRY—MEDICINE

In what particular fields will the chemist aid the medical researcher? p. 120.

DOCUMENTATION

What new development will facilitate international exchange of scientific information? p. 124.

ENGINEERING

How can motorists of the future dodge the mountains between Harrisburg and Pittsburgh? p. 118.

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When did the Arctic have its first gold rush? p. 124.

METALLURGY

How much gold is in the world? p. 120.

MYCOLOGY

Do fungi eat animals? p. 120.

ORNITHOLOGY

Why does chasing starlings prove a benefit to them? p. 121.

PHARMACY

Why do drug plants vary in their medicinal contents? p. 119.

PHYSICS

Is there a gun that can aim itself? p. 126.

ASTRONOMY

Plane Eclipse Pictures Show Million-Mile-Thick Corona

Photographs Taken By Amateur Astronomer But Veteran Stratospherist Result in Discovery

THE SUN'S corona consists not merely of the spectacular array of pearly-hued streamers seen during a total eclipse, but of a uniform, globular, million-mile-thick blanket.

Such is the revelation of photographs snapped from a sub-stratosphere airplane during the June 8 eclipse by Major Albert W. Stevens, noted for his stratosphere balloon explorations, who was a member of the Hayden Planetarium—Grace Eclipse Expedition. The implications of this discovery were discussed at a conference held at the Harvard College Observatory.

Leading astronomers attending the conference say that all of Major Stevens'

plates "clearly show the corona as a globular shell surrounding the sun with a depth considerably greater than a solar diameter."

Streamers Less Important

Heretofore astronomers studying the corona have devoted most of their attention to the radiant streamers which completely dominate the usual eclipse photographs taken from the ground. On Major Stevens' plates, however, the bright tracery has been proved to be of secondary importance in the immense globular envelope.

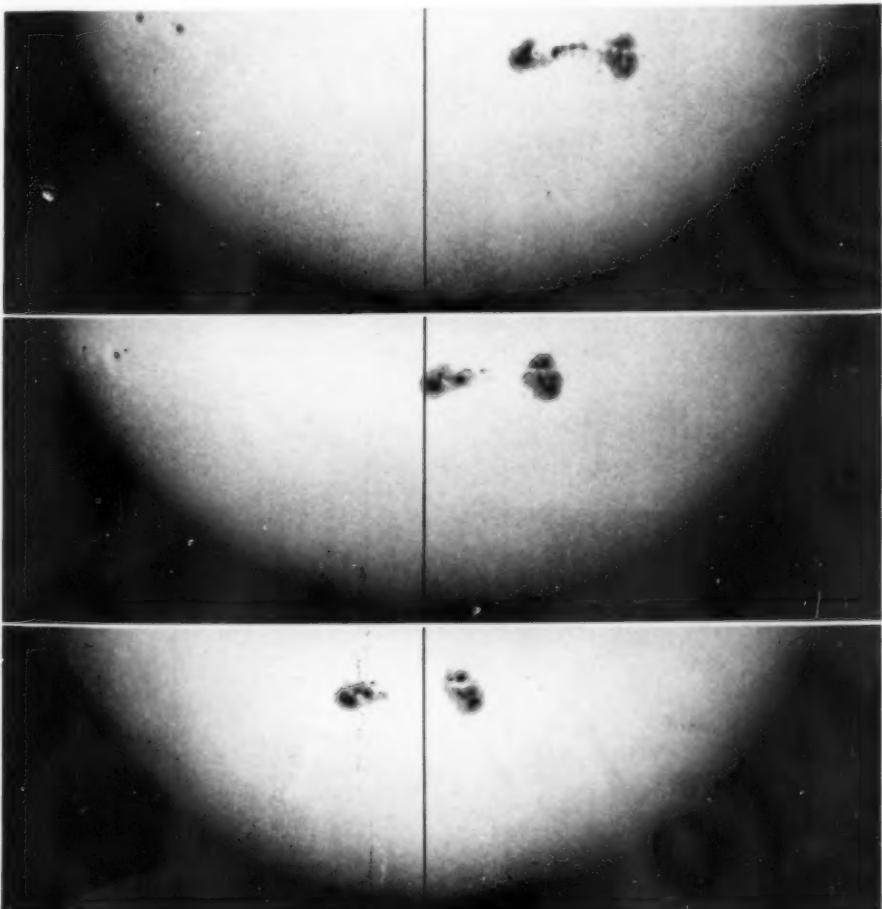
According to Dr. Harlow Shapley, director of the Harvard observatory, the

great difficulties encountered by Major Stevens in making his observations at a 25,000-foot altitude were well worth while, for it was this great height that made his remarkable pictures possible. In the sub-stratosphere Major Stevens was above approximately two-thirds of the earth's atmosphere, and thus avoided most of the dust particles and air molecules which tend to obscure ground pictures of such difficult subjects as the corona.

An interesting feature of the discovery is that Major Stevens' highly important findings were unexpected and largely accidental. One of numerous field observers in the Hayden Planetarium-Grace expedition, Major Stevens aimed principally at reaching a sufficient altitude to photograph the spectacular course of the moon's shadow racing across the earth.

May Revise Methods

His discovery, it was predicted, will probably affect traditional methods of observing eclipses, leading to increased use of sub-stratosphere observations. Further analysis of the corona must await the South American-South African eclipse three years hence, when scientists plan to study the (*Turn to next page*)



PHOTOGRAPHY

Over Twenty Earths Could Be Put In Giant Sunspots

YOU could drop over twenty earths into the giant sunspots which recently obscured the surface of the sun.

When observed on July 26 the spots were joined into a single greater unit that occupied some 20 square degrees of the sun's surface. This area amounts to well over a billion square miles and more than equals the area of twenty great circles formed by cutting an imaginary section through the earth at the equator.

Astronomers are interested in the spots not alone because of their size but also because the "parent" spot reversed the usual procedure of a sunspot and broke up as it approached the sun's meridian line.

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SPLITTING

Almost as groups of cells divide, this huge group of sunspots is splitting in the middle as it nears the meridian of the sun. The photographs were taken at the U. S. Naval Observatory on July 27, 28, and 29.

phenomenon from the sub-stratosphere with ultraviolet lens systems, spectrometers and polarizing screens.

Another comment on the discovery came from Dr. Donald H. Menzel, Harvard's authority on solar phenomena and leader of the Harvard-Massachusetts Institute of Technology expedition to Siberia last year. Major Stevens' discovery, he said, is "of great importance and will have an immediate bearing on the interpretation of the structure of the sun's upper atmosphere."

Guided by Major Stevens' discovery, Dr. Menzel has re-examined plates taken by Harvard last year, and has found the globular coronal blanket recorded on some of them, although, because of the brighter sky background, they showed not nearly as clearly as on the photographs taken in the sub-stratosphere. Two European astronomers, Bergstrand and von Klueber, had obtained previous indications of the globular form of the corona, but a complete appreciation of its nature was not reached until Major Stevens' pictures were studied.

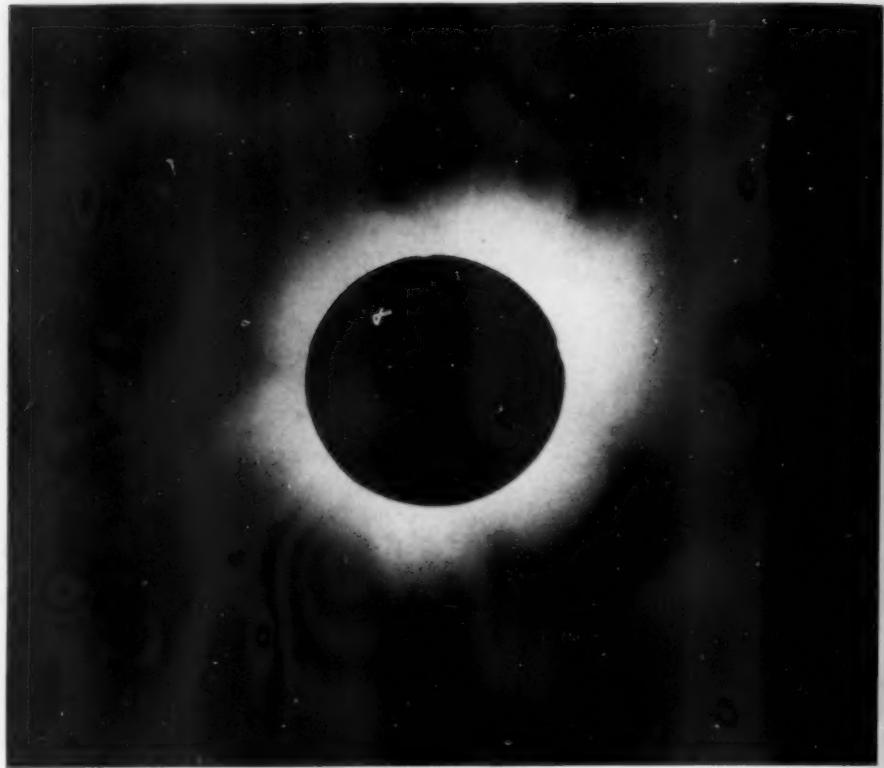
No Optical Defect

Rigid tests by Drs. Kenneth Mees and Walter Clark of the Eastman Kodak Laboratory, and by Dr. Brian O'Brien of the Institute of Optics of the University of Rochester, were made to investigate the possibility that the unusual appearance of the corona on Major Stevens' plates was caused by optical or photographic defects, or by minute ice particles in the stratosphere. Fifty scientists from a dozen American observatories accepted the results of these tests as conclusive evidence that a natural phenomenon had been photographed.

In reporting the discovery, Dr. Shapley pointed out that two of the most significant observations of this year's eclipse were made by amateur astronomers. Major Stevens, although an expert in stratospheric flight and aerial photography, is not a professional astronomer, while the best coronal photographs ever made in polarized light were snapped by an amateur astronomer, Fernando de Romana, of Arequipa, Peru.

Major Stevens' pictures were taken near Lima, in a Pan-American Grace Airways plane, piloted by Capt. Charles Fisher and co-pilot W. E. Gray. W. O. Runcie, Lima photographer, assisted in the difficult task of making the pictures. They include 11 photographs with a 24-inch camera, four with an 8 1/4-inch camera and 150 feet of motion picture film made with a 6-inch lens.

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USUAL PRINTING

In this print made by the customary method of shining light through the negative, the delicate detail of the globular corona is largely lost. This is Major Stevens' photograph taken during June 8th eclipse at an altitude of 25,000 feet. See illustration on next page.

ANIMAL PSYCHOLOGY

Bass Taught to Distinguish Between Colors in Research

WHEN you select a fly with a dash of red, or trail a plug or spinner gaudy with yellow, you have good scientific warrant for the use of bright colors in luring your fish. Experiments supporting this conclusion are described in a new publication of the Illinois Natural History Survey.

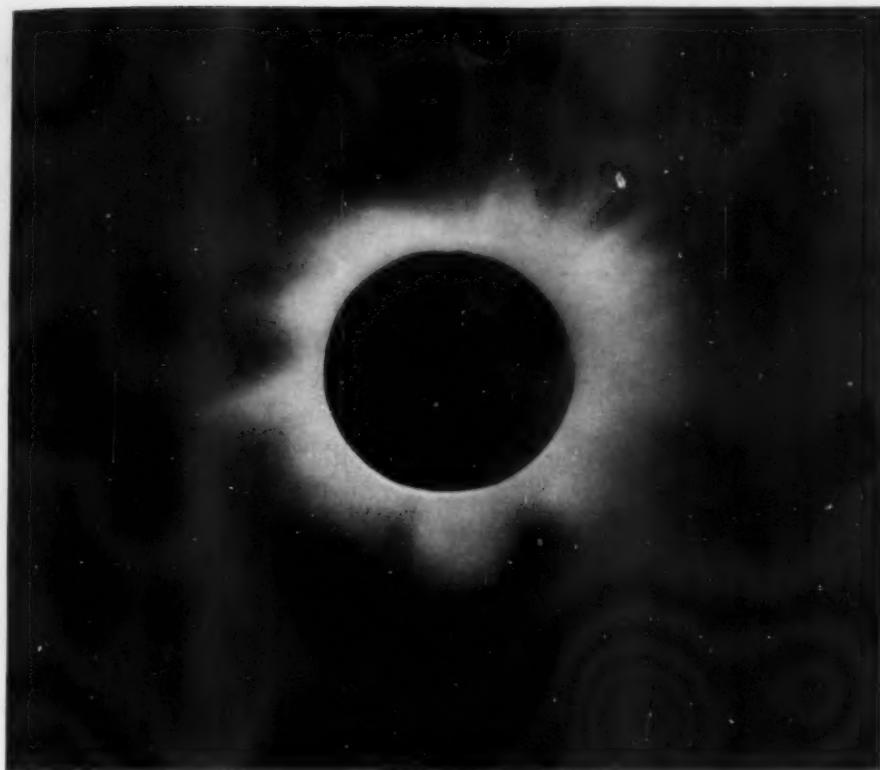
The experiments, performed by Dr. Frank A. Brown, Jr., indicate that large-mouth black bass "are able to distinguish among colors in about the same manner as would a human being with perfectly normal color vision, looking through a yellowish filter."

A system of rewards and punishments was used to train fingerling bass to distinguish between colors and various shades of gray. Individual fish were kept in pans of water and rewarded with a water flea or a mosquito wiggler when they approached the proper color, or

punished with a light electric shock when they came near any other color or shade of gray. Medicine droppers covered with adhesive tape of the different colors and shades were always shown the fish at the same place in the pan. Fourteen thousand tests of trained bass were made.

Large-mouth black bass are alert, active and lend themselves readily to laboratory experiments. Five to ten training trials are sufficient to teach them to discriminate between red, yellow, green and blue. When the difference in color is small the training must be longer. Memory for certain colors lasts for weeks, perhaps months. Fish trained to come to rose red can distinguish unaccustomed shades and tints and combinations of red from black, white and all intermediate grays. Yellow and green are also recognized as colors but less certainly.

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GLOBULAR CORONA REVEALED

The delicate detail of the newly discovered envelope is brought out by photographing the image on the negatives onto other film by reflected light. This was done from Major Stevens' high altitude photograph by the Eastman Kodak Research Laboratories.

BIOLOGY

Find That Plant Cancer Can Be Caused by a Chemical

AN important discovery of how tumors can be caused in plants, made at the University of Chicago, may influence the trend of research in the study of human cancer.

The husband-wife research team of Profs. George K. K. Link and Adeline DeSale Link, with the help of research assistant Hazel W. Wilcox, found that crown gall, or plant cancer, can be created by applying a special chemical to a plant. Significant point is that this plant disease, long known to be caused by the bacterium organism *Phytophthora tumefaciens*, can also be caused by the application of a growth hormone, beta-indoleacetic acid, an organic chemical compound.

In the plant experiments it was discovered that the applications of the organic acid not only could produce plant tumors but also, when given in varying concentrations, produced different ef-

fects. Some treatments stimulated healthy growth of the plant and other treatments produced "every type of disease symptom known to the plant pathologist," to quote the announcement of the discovery.

"Research workers in human cancer," continues the report, "have been searching for a specific substance responsible for the production of unhealthy cell growth. The botanical discovery that a growth hormone, under varying conditions and in varying amounts and concentration, causes diverse effects may open an additional line of attack on the cancer problem."

Crown gall is a plant disease of economic importance in the rose family, particularly apple trees. Botanists have known for 30 years that the disease is caused by the bacterium, which enters wounds, especially improperly made grafts. The disease is controlled through

quarantine and destruction of infected trees.

While crown gall is known as a plant cancer it is unlike human cancer in that it does not show the process of metastasis, in which human cancer sends into the blood stream cells which can cause cancer in the other parts of the body. Plants, of course, do not have a circulatory system in the human sense of the word. Rather the spread of crown gall through a plant is accomplished by sending out strands which can cause other galls to occur.

Beta-indoleacetic acid, causing the plant cancers, has been known since the 1880's and in the last five years it has been found to be a growth hormone.

By controlling the concentrations and the amounts of the acid applied to plants the Chicago investigators have been able to produce all the following conditions in plants: tumors, wilting, discoloration, root formation, death and healthy growth.

The report is published in the *Botanical Gazette*.

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ANTHROPOLOGY

Fossil Man of China Now Considered Oldest Human

WHO was the first man? This is one of the major questions of all science.

In layers of earth in various parts of the world are found a few fragmentary bones of human-like creatures that lived and died long before the dawn of history. This record of human evolution constitutes one of the great pieces of scientific sleuthing.

In China, not far from Peiping, near the scene of the Japanese-Chinese military and commercial struggle, over a score of ancient fossil human remains have been found at a site called Choukoutien. *Sinanthropus pekinensis* is the name given to these extremely primitive yet human creatures. *Sinanthropus* is pronounced even nearer to the apes than famous *Pithecanthropus*, ape man of Java.

Dr. Franz Weidenreich, visiting professor of anatomy at the Peiping Union Medical College, looks both ways in time from the era of *Sinanthropus* and foresees that the ancient soil of Asia will bring forth relics of men both earlier and later than the men of Choukoutien. *Sinanthropus* was living before the great Ice Ages, the Pleistocene, began. He knew the use of fire and implements. Obviously human culture began with a

human being still older. For this reason the scientists are turning to old deposits of the earth, called the Tertiary, confident that there will be found the solution of the true riddle of human evolution.

While Sinanthropus has many characteristics of modern man, Dr. Weidenreich feels that there will be found in

Asia a link between him and modern men, a kind of ancient man somewhat like the Neanderthalers of Europe. He is convinced that Sinanthropus is a direct ancestor of modern man, at least the Asiatic variety, and that somewhere among the direct ancestors of Sinanthropus was a creature whose future descendants included both men and apes.

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CHEMISTRY

Wool Made Unshrinkable By New Revolutionary Invention

Simple Dipping in Chemical Does the Trick Without Damaging Durability, Softness or Fluffiness

A NEW, revolutionary method which solves the old problem of making wool unshrinkable, without damaging it in any way, has just been invented by A. J. Hall, English textile chemist.

The important feature of Mr. Hall's process is that it permits shrinking wool without adversely affecting its durability, its original softness and fluffiness, and its color—something which heretofore has proved to be impossible. These defects have been associated with unshrinkable processes for over forty years, since they were first practiced. In spite of much research, they have remained unsolved.

Extremely simple, Mr. Hall's method merely consists of dipping the wool in a solution containing the chemical sulfuryl chloride. The chemical is dissolved in "white spirit"—a solvent which is used a great deal in dry cleaning. About 1½ to 2 per cent. solution is used and the

treatment lasts about an hour.

Already Mr. Hall's invention has aroused considerable interest among wool manufacturers and finishers. Many important firms have taken out licenses under the patents which are being applied for in most of the countries throughout the world.

Previously it was always thought that to make wool unshrinkable, treatment with chlorine in some active form—like sodium hypochlorite or chlorine gas, the same gas used by Germans in the first gas attacks in the early stages of the war—was necessary. But always the wool came out with a harsh feel. If the wool was dyed, the treatment bleached the dyes. Then if such unshrinkable wool was made into clothes, they did not last as long as garments made out of untreated wool.

Tests on wool treated by Mr. Hall's

processes show that all these defects are overcome. The wool has the original soft and fluffy feel. It is just about as durable as the untreated wool. Its color and the dyes on it are not changed in the least. The wool does not seem to be chemically altered at all, the microscope reveals.

Other features of the new method are: wool can be treated as it comes from the sheep's back or in the form of socks and other clothing. The wool does not have to be washed first, or treated in any special way. The treating solution can be used over and over again and Mr. Hall has used the same solution for over a year. It is only necessary to add sulfuryl chloride as it is used up, and purify the solution once in a while.

Wool mixed with rayon and cotton can be treated without harming these fibers, provided they are not too damp.

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ENGINEERING

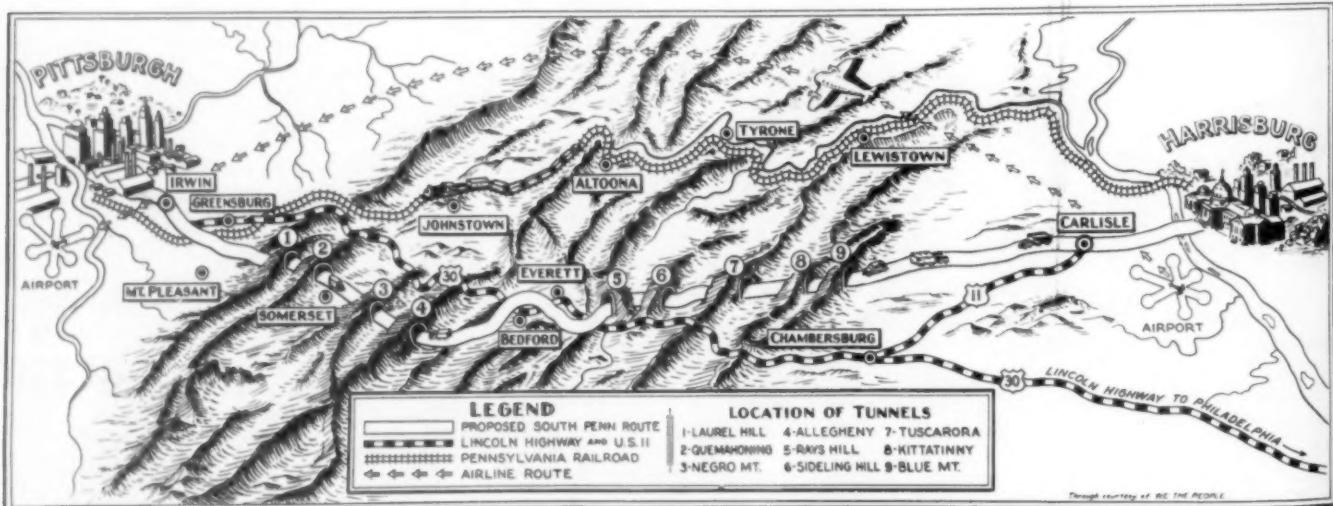
New Mountain Highway Will Have Nine Tunnels

RELIEF for the American motorist on one of the toughest year-round trips in the country—between Harrisburg and Pittsburgh directly across the Allegheny Mountains—is now under way.

Imagine a super highway through this rugged country for 165 miles of which 125 miles will be in a straight line, averaging only one curve per mile and with no grade greater than three per cent.

CLIMB DODGER

This picture map shows how the new highway will dive under mountains to smooth the way for motorists





HOW IT LOOKS NOW

East portal of the Blue Mountain tunnel in Franklin county, Pennsylvania, which will be used in the super highway through the Alleghany Mountains. There will be nine tunnels totaling seven miles in length.

Seven miles of tunnels through the mountains will save the motorist 10,000 feet in accumulated vertical climb and wherever possible the highway runs on the south side of mountains to facilitate wintertime travel.

Key to the project is the old South Penn Railroad which was laid out some fifty years ago and then abandoned with its nine tunnels half finished. Still in excellent condition the tunnels will be drilled through and ventilated for motor vehicle traffic.

Tunnel Highway, as the road will be known, will have no major highways or railroad crossings at grades. There will be ramp entrances to the highway.

Because of the broad curves, low grades and great sight distances it is anticipated that speeds of 50 and 60 miles an hour will be safe on the highway. It is planned that four lanes of traffic will be provided, two in each direction, with a planted center strip providing permanent separation of traffic in the two directions.

All parts of the right-of-way are above the highwater mark of even such floods as that of March, 1936. It is estimated by the Pennsylvania Department of Highways that from five to six hours will be cut from the present running time between the two terminal cities.

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PHARMACY

Stabilization of Drug Plants Should Follow Lead of Foods

FOOD plants were standardized long ago; drug plants should follow their lead. The necessity for this was pointed out by Dr. Arno Viehöver, of the Philadelphia College of Pharmacy and Science, at the meeting of the American Pharmaceutical Association in New York City.

We know to a fractional per cent.

how much starch to expect in a given strain of potatoes or how much gluten in a variety of wheat, but the quantity and quality of digitalin in a batch of foxglove is still pretty much a hit-or-miss matter.

This is because food plants have long been carefully bred, and adjusted to the soil and climate of the regions

where they are cultivated, whereas drug plants are still either gathered wild in the woods, or if cultivated have not yet been improved by breeding.

Modes of preparation, too, are greatly in need of standardization, Dr. Viehöver declared. Too many drugs are simply dried in the open air, or otherwise made ready for market by grandmothers' methods, despite the fact that machinery for control of temperature, humidity, aeration and other factors has long been in use in other industries, including food preparation, and could be adapted to the drug industry without much difficulty.

Not only is the cultivation of drug plants important. The season when they are gathered, and even the time of day, may affect the quality of the medicines prepared from them.

Decomposition of the drugs by enzyme action must ordinarily be guarded against but in the case of certain drugs such as cascara and possibly digitalis, Dr. Viehöver pointed out, partial decomposition by enzyme action makes the drug a more successful medicine. Scientific pharmaceutical practice must take all these factors into account.

Improves Trench Mouth Remedy

A method of improving sodium perborate, the tooth powder remedy for trench mouth or Vincent's infection and other ails of teeth and gums, was reported by L. L. Manchey and S. Lee of New York.

The harmful effects of this remedy have been attributed to its being too alkaline—the opposite of too acid but equally irritating. The New York pharmacists found that by mixing mono-calcium phosphate with the perborate, they could reduce the alkalinity of the perborate to about that of human saliva. Tests made by applying the new mixture to the gums of human subjects showed that it had no harmful effects.

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ORADIO

August 24, 4:15 p. m., E.S.T.

ADOPTED CHILDREN—Dr. Mandel Sherman, psychologist of the University of Chicago.

August 31, 4:15 p. m., E.S.T.

SOUR WATER—Ralph E. Tarbett of the U. S. Public Health Service.

In the Science Service series of radio discussions over the Columbia Broadcasting System.

CHEMISTRY

Rayon From Rice Husks Is Newest Japanese Industry

A \$2,900,000 industry is being promoted in Tokyo with the object of producing rayon-making pulp from rice-husks, of which a practically unlimited supply is assured in Japan.

The process which forms the basis of the new industry has been developed by the Tokyo Industrial Laboratory, a division of the Department of Commerce and Industry, in collaboration with the research institute of the South Manchuria Railway Company.

Because Japan depends on imports for 250,000 out of 300,000 tons of rayon pulp annually consumed by the artificial silk industry, the supply of raw material from an entirely new source is expected considerably to benefit the textile industry as well as the farmers who are hard put to make a living from their scanty acres.

Japan at present is among the world leaders in the production of rayon yarn. And Japan is the world's first rice grower. The annual crop averages 475 million bushels. Since one bushel of rice yields about 419 pounds of husk, the entire turnover of the rice crop in Japan should yield nearly four billion pounds of husk a year. At present rice-husks are thrown away as practically worthless.

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METALLURGY

Gold Mined Since 1492 Would Make 41-Foot Block

GOLD is troublesome stuff. Men snarl and fight over it like dogs, dig it up, bury it again as a dog re-buries a treasured bone. For some obscure reason, we do not know what to do without it, yet we do not know what to do with it.

We can get scientific information about where gold comes from, even if not economic counsel on what to do about it, from a new book, *Gold Deposits of the World*, by Prof. William Harvey Emmons of the University of Minnesota, formerly a member of the U. S. Geological Survey.

Prof. Harvey opens with a few figures that impress at first with their magnitude, but on second thought impress just as much with their relative "minutiae." It is estimated, he says, that since the discovery of America in 1492 to the end of 1935 the world produced

1,194,913,216 ounces of gold. At the present price of \$35 an ounce, this would fetch \$41,821,962,560. A tidy sum; yet if it were all in Uncle Sam's possession at present not a great deal of change would be left over if it were used to pay the National Debt.

If all of this mass of gold were still in existence and all cast into one lump, it would make a cube only 41 feet on an edge. This makes the fact easier to grasp, that Uncle Sam is able to put his 40 per cent. share of the world's existing ingot gold into one cellar in the Kentucky hills and sit on it with the aid of only a handful of soldiers.

Of the gold produced between 1492 and 1935 less than 10 per cent. was obtained in all the time from 1492 to 1800. During the nineteenth century 31.3 per cent. of the total was added, and in the first 35 years of the twentieth century all the rest, nearly 60 per cent., came out of the earth.

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MYCOLOGY

Fungus Lassos and Devours Unlucky Animal Prey

AFUNGUS, a sort of fifth cousin to the common bread mold, that captures and eats small worms was recently described by Dr. J. N. Couch of the University of North Carolina. While insect-eating plants such as the Venus fly trap and the pitcher plant are quite well known, animal-catching fungi are rare.

The fungus grows in a thread-like form. Loops are spaced at intervals along the thread. These are the traps. When a worm sticks its head or tail into one of these loops it contracts, tightening up on the worm and holding it fast. At times a worm may be caught by two of the loops.

When the worm is firmly held, small threads grow out from the main thread. They penetrate the body of the worm and digest it. Dr. Couch was able to watch the capture and digestion of the prey.

The interest aroused by his report before the North Carolina Academy of Science led to the award by that body of a gold medal which entitled Dr. Couch to become a contestant for a prize of \$100 to be awarded for the most outstanding paper presented before the Academies of Georgia, North and South Carolina and Virginia. Dr. Couch was awarded the grand prize.

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IN SCIENCE

ZOOLOGY

European Bison Dwindling; Only Eighty-Four Are Left

IN STRIKING contrast to the now seemingly assured survival of American buffalo, or bison, is the still precarious status of the European bison, or wisent. There are only 84 head of pure-blooded animals left, a summarizing study of the International Society for the Preservation of Wisent shows.

In addition to the pure-bloods, there are a good many hybrid wisent, results of crosses with American bison. By a process called "elimination breeding," in which only pure-blooded bulls are used with hybrid cows, the proportion of bison blood is being reduced in the hybrid stock, so that eventually these will be almost full-blooded wisent also.

Before the World War there used to be a large herd in the Russian Caucasus and another in Poland. During the war and the confused period afterwards, these animals were all killed by distressed populations needing food at any terms. The small herd now re-established in the U. S. S. R. does not seem to be pure-blooded. In England also the only herd, on the estate of the Duke of Bedford, is hopelessly hybridized.

In Sweden, Germany, and Poland, however, the pure-blooded and hybrid herds are kept sharply separated, so that the historic stock may be maintained as nearly as possible in its original state.

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CHEMISTRY—MEDICINE

Chemistry Should Aid Medicine In Four Fields

CHEMISTRY and the chemist will determine the success of four great divisions of medical research now under way, declares the Nobel Prize winner in medicine, Prof. George H. Whipple, Dean of the School of Medicine and Dentistry at the University of Rochester. The four fields of medicine are: virus diseases, studies of the ductless glands, chronic diseases and studies of the physiology of the central nervous system.

Science News Letter, August 21, 1937

THE FIELDS

ARCHAEOLOGY

Rattles Were More Used By Adults Than Babies

ALMOST 5,000 years ago, babies in the old city of Kish in Mesopotamia were kept happy with rattles, says Richard A. Martin, archaeologist, of the Field Museum of Natural History. Yet, rattles have been used more by adults than by children in most lands explored by science.

Soldiers in ancient China were stirred by music of bronze rattles in military orchestras. African tribes devised many kinds of rattles for use in magical rites. Egyptians had a kind of rattle called a sistrum, made of a staff with metal rings dangling at the end, and used in solemn religious ceremonies. American Indians used rattles in religion and magic.

Modern Europe and America stand out as exceptions in using rattles mainly for amusing babies.

Rattles unearthed at Kish include some shaped like goats and hedgehogs, to catch the babies' eyes, as well as amuse them with the jingle of pebbles inside the hollow toys.

Science News Letter, August 21, 1937

SOCIOLOGY

Fine House Not Always Makes Successful Home

THREE is a difference between "house" and "home." The house is the physical structure, but the home is an edifice of feeling, sentiment and social contacts that brings together the family and the house.

The importance of understanding this relationship in our national efforts to better the housing conditions of many localities is stressed by Dr. Carle C. Zimmerman, Harvard sociologist, in his new book "Consumption and Standards of Living" (Van Nostrand).

Stability or what Dr. Zimmerman calls a "symbolically permanent attachment" between a family and its hearth is important to the psycho-social magic that surrounds a home.

Take the mill villages of the South. Stabilized home conditions are found in

the most ordinary types of houses, while there are exceedingly demoralized conditions among some of the dwellers in the better homes. Often conditions are such that families are not sure of being able to stay permanently in their houses; they can not build up a true home.

"Haggard, demoralized faces often peer out of the doors and windows of many of the well-painted company residences," says Dr. Zimmerman, "while peaceful happy faces are to be seen often in the crude outlying villages where the mill employees own their own homes and are in more or less permanent attachment to the industry and the place."

Of great import to housing reform are these sociological and psychological aspects. Houses can be built, but of equal importance is the rebuilding of the home spirit. Along with firm foundations and livable dwellings, there must be long-time and increased stability of the tenures of the families who will dwell in the new houses.

Not always is a new house or a better house an unmixed blessing. People who live in fashionable suburbs where they have to keep up with their neighbors may support an unnecessarily expensive house and restrict the size of their family.

Science News Letter, August 21, 1937

ORNITHOLOGY

Chasing Away Starlings May Be Kindness to Them

CHASING starlings off their roosts with balloons on strings, noise-making devices, and so on, may be doing them a favor, a report in *Nature* on the investigations of Prof. William Rowan of University College, London, indicates.

Prof. Rowan found that forcing birds to exercise, even in dim light, had the effect of stimulating their sex glands and starting the breeding season earlier. With many other workers in his field, he has also studied the stimulating effects of artificial lighting on their breeding cycle.

He captured and dissected a number of starlings in the busy, brightly lighted West End of London, well before the beginning of the normal breeding season. A number of country starlings were also killed and studied. Both male and female birds that had been exposed to city glare and disturbance were much farther advanced toward breeding activity than were their kin-starlings from the quieter countryside where the bright lights do not shine.

Science News Letter, August 21, 1937

PALEONTOLOGY

Find Extinct Beast Big As a Hippopotamus

FOSSIL remains of a hitherto unknown species of extinct mammal, big as a hippopotamus, have been found in Colorado by an expedition of the Field Museum of Natural History. Bryan Patterson, in charge of the expedition, reported the find.

The creature lived in the early days of the Age of Mammals, about 45 million years ago, when the region that is now the Rocky Mountains was a low, flat plain.

Science News Letter, August 21, 1937

ASTRONOMY

New Comet Is Discovered; Finsler's Has Second Tail

THE much-watched Finsler comet which is now speeding across the northern sky and which can be seen with the unaided eye, has now been joined in the heavens by a new comet.

Dr. Edwin P. Hubble, noted astronomer of the Mt. Wilson Observatory in California, has found, with his powerful telescope, a very faint comet of the 13th magnitude in the constellation of Aquarius, midway in the southern sky. This news is revealed by Harvard University Observatory, which acts as the clearing house for astronomical news in this hemisphere. The new object, to be known probably as the Hubble comet, is much too faint to see with the naked eye.

At the same time Harvard Observatory confirmed reports that the Finsler comet has a second tail, a short one hardly one-tenth the size of the big one, 2,000,000 miles long. A Baltimore, Md., amateur stargazer first noted this second tail.

Powerful instruments are needed to see the smaller tail although the unaided eye can see the comet itself. Small field glasses will reveal the large comet tail. Finsler's comet reached its maximum in brilliance on August tenth when it was near the middle star in the handle of the Dipper.

The position of Dr. Hubble's new comet in the southern sky was given as: right ascension 22 hours, 49 minutes, 19 seconds, and declination south, 21 degrees and zero minutes. Its diameter is 30 seconds of arc and its motion 30 seconds west and 5.5 minutes south. Further observations are being taken and more information about it, including its orbit, should be learned soon.

Science News Letter, August 21, 1937

ASTRONOMY

A Tower to Stop the Sun

Unique Mirror Set-Up at Lake Angelus, Michigan Catches the Sun and Puts Its Flames Into Movies

By DR. FRANK THONE

See Front Cover

HOT lately, isn't it? . . . Seems like there's more thunderstorms, too . . . Caused by sunspots? . . . Papers say they've been getting bigger lately—more of them, coming in bunches . . . Wonder how scientists find out all that kind of thing? . . .

Vague, conjectural, scrappy talk, that you may hear on any simmering street corner, or in the moist spots where people get together to cool off and slake their thirst.

Whether the sun and its spots have any direct influence on earthly weather is a question very far from being definitely settled. Among scientists there are ardent "spot-weatherites," and there are equally ardent "anti-spotters," and they have at each other with great gusto,

" . . . in learned argument about it and about."

But evermore they come out by that same door where in they went. And probably the great majority of interested scientists remain agnostic on this question; can't decide until we have more data, they say.

Affect Communication

There is no doubt whatever, though, that changes in activity on the sun affect our daily lives in a less direct though exceedingly important way. At certain stages in sunspot development, there occurs on earth what is known as a magnetic storm. The skies may be clear on earth and the winds but gentle zephyrs during one of these storms, but they raise very Ned just the same. For the storm occurs in the earth's magnetic field, and it puts telegraph lines, long-distance radio communication, and trans-Atlantic telephones all out of business, sometimes for hours on end. And in the sensitively balanced state of affairs we call civilization, such interruption in communications is catastrophic.

Wherefore, because of these and the many other everyday importances of the sun, as well as for the sheer delight of knowing some new thing, many astronomers are devoting their lives to solar

study. They have learned many things about this great flaming star that keeps us all warm and alive, but they need and want to know far more.

Newest among the world's battery of heavy scientific artillery besieging the stronghold of the sun is the fifty-foot tower telescope of the McMath-Hulbert Observatory of the University of Michigan, located on the shores of Lake Angelus, near Detroit. This observatory was founded originally not by or for professional astronomers, but as a serious avocation outlet for three prominent Detroiters, F. C. McMath, R. R. McMath, and H. S. Hulbert. Mr. Hulbert is a judge, the McMaths are civil engineers who later became manufacturers.

Given to University

After it had been built and equipped, the observatory was offered to the University and accepted as part of its equipment. R. R. McMath continues to act as its director. A number of eminent professional astronomers have worked with him, particularly members of the Mount Wilson, Calif., observatory staff. Mr. McMath and Edison Pettit of Mount Wilson are joint authors of an important scientific paper that appeared in *The Astrophysical Journal* a short time ago.

The first reason for the building of the McMath-Hulbert Observatory was to get motion pictures of the heavenly bodies, something that had never been done before. With a conventional telescope and a motion picture camera controlled by a specially constructed time-lapse drive, fascinating movies of such things as the 1932 solar eclipse, Jupiter's satellites, and sunrise on the moon were obtained as much as half-a-dozen years ago.

For a number of reasons, however, this first equipment was not considered satisfactory for getting motion pictures of events on the sun. Something bigger, specially adapted for solar work, was wanted.

One of the most satisfactory types of instrument for "shooting the sun" is the tower telescope. There were already several of them in the world; though they are all surpassed now in size and

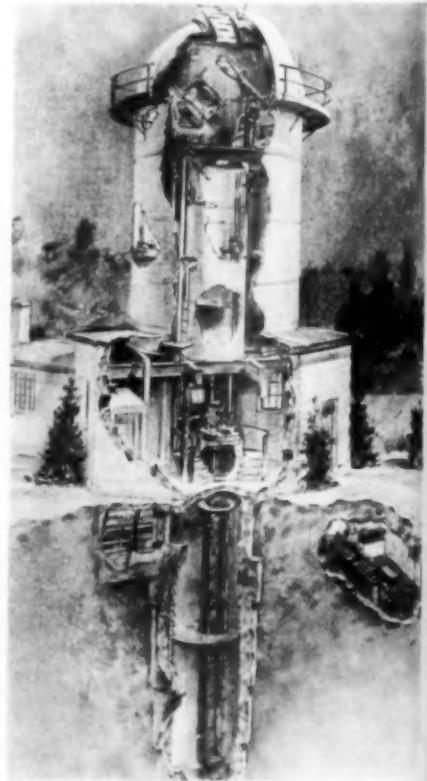
power by the new one at Lake Angelus.

The usual types of telescope are always pointed directly at the celestial object viewed or photographed. A tower telescope, on the contrary, always points straight upward, at the zenith; its whole length corresponds to the tube of the conventional instrument.

Sky-Stopper

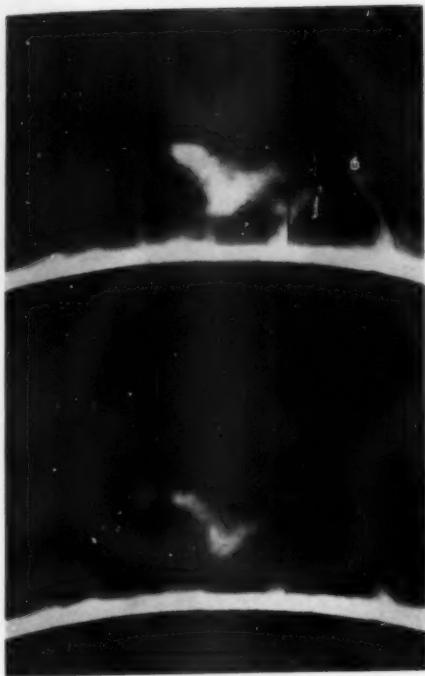
At its top, looking out through the slot in the dome, is a mirror held at an angle, to catch the image of the sun. It throws this reflection against a second mirror, held at a complementary angle. The second mirror throws the beam straight down the long shaft of the tower to where the optical working parts and cameras are waiting to receive it.

Such a set-up of mirrors is known as a coelostat—Greek for "sky-stopper." It doesn't stop the heavenly objects in the march across the sky but by following



HOW IT WORKS

A cut-away view of the 50-foot tower telescope of the McMath-Hulbert Observatory, showing arrangement of instruments, location of workrooms, etc. Drawing by Russell W. Porter.



RESULTS

Enlarged "frames" from the McMath-Hulbert Observatory films of flame-changes on the sun.

them in the right manner it holds their images stopped at the bottom of the shaft. It is a veritable robot Joshua.

In erecting their tower telescope the McMaths showed how an engineering training can come to the aid of scientific enterprise. They built it double-walled, to afford as much insulating air space as possible, for the central shaft and its instruments must be protected against temperature changes that cause things to expand and contract, and so throw delicate adjustments out of line. The space between the outer wall and the central shaft accommodates a staircase to the top.

Economy

The dome that covers the top of the tower represents a stroke of ingenuity that is almost genius. It was discovered that observatory domes built to order cost most outrageously. But manufacturers of water tanks for industrial plants make hemispherical bottoms for them in a wide range of sizes and at regular market prices. So Mr. McMath ordered one of these water tank bottoms, turned it over, cut the regulation observatory slot in its side—and had a perfectly good top for his tower at a fraction of the custom-built cost.

The device at the camera end that makes the new sun movies possible is an interesting evolution of the age-old

prism for splitting a narrow beam of sunlight into a rainbow-colored band or spectrum.

Put into a suitable mounting, such a prism becomes a spectroscope. Apply a camera to a spectroscope, so that it writes a permanent record of its spectrum on the plate, and you have a spectrograph.

Spectroheliograph

The next stage in the development belongs to the Mount Wilson Observatory. Many years ago, Dr. George E. Hale of its staff developed an instrument in which the slit through which the sunlight is admitted could be moved. Within the instrument was a second movable slit, timed to travel in step with the first. This would be arranged so that the only light passing through the second slit would be from a single one of the many elements on the sun's glowing surface—say hydrogen or calcium. Each time a photographic plate was thus "wiped" with a one-color line of sunlight, it left a picture of the sun in terms of that light. Because his instrument was a special kind of spectrograph used for the study of the sun, Dr. Hale christened it a spectroheliograph.

In the McMath-Hulbert Observatory, the spectroheliograph is adapted to the speed of the motion picture camera, taking a photograph of the sun (or portion of the sun's disk) for every frame. Because movie cameras used to be called kinematographs (back when the present grayhaired generation were kids) Mr. McMath combined the two names into one long breath-taking tongue-twister and called his machine spectroheliokinematograph. Which describes the instrument nicely. But probably they don't take time to say all of it around the Observatory, at least when they're having to hurry.

The astronomers at the McMath-Hulbert Observatory worked on their solar motion pictures for two years or more before they considered them ripe for a public showing. Then they brought them out—and took critical scientific audiences by storm. Their pictures were a sensation when they were shown before the American Astronomical Society when it met in Cambridge at the time of the Harvard Tercentenary. A short time later the films were run at a meeting of the National Academy of Sciences and again (in the language of *Variety*) "wowed 'em."

Here are some of the things you will see when you get a chance to watch the new solar films: the sun's disk is blocked

off by a curved metal shield, to cut down glare; at its edge, shining over the shield, rises a great, palm-like tree of fire, which pulls itself up bodily and hurtles through the atmosphere, to fall in a long arc; smaller, slenderer streamers spring up like wheat in a field, and like wheat sway in ripples as though a wind were blowing over them.

Earthlings that we are, we cannot think of events like these except in terms of wind, gale, tornado. The sun-spots, tornadic swirls as they appear to the eye, seem to have even more importance as centers of terrific electric and magnetic activity. What the nature of the attraction is, that pulls toward them the vast masses of matter from the surface of the sun, remains uncertain, but the new motion pictures of these stormy events show their mode of action more clearly than has ever been done before; and where scientists can see how a thing happens they are in better position to figure out why it happens.

Sudden Bursts

One very puzzling thing has been seen in the Observatory films, that had escaped previous visual or single-photograph observations. Enormous clouds of visible matter suddenly form high in the sun's atmosphere, apparently unfed by anything thrown upward by the usual type of eruption. It is difficult to account for these sudden appearances, but careful examination of the films indicate strongly that they are not optical illusions on the part of the camera.

Sizes and velocities of these solar storms and eruptions are truly titanic. What Mr. McMath calls "surges"—sudden upwellings of solar material without actual eruption—have been caught by the camera rising up to a height of more than 43,000 miles, with a velocity of 125 miles per second. Another type of outburst, first photographed when it was about 68,000 miles high, climbed to a height of approximately 83,000 miles in a minute and a half, at a velocity in the neighborhood of 190 miles a second.

Figures like these awe the layman by their mere magnitude. They awe the astronomer, too, with the thought behind them of the vast energies involved. But more than they awe him, they inspire and stimulate him, for they represent the opening of hitherto closed doors through which they can go to a better understanding of the sun.

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Science News Letter, August 21, 1937

DOCUMENTATION

Unpublished Manuscript To Be Accessible to Scholars

Microfilm Seen as an Aid to International Exchange Of Scientific Information; Rare Books Can Be Filmed

ANY BOOK in the world, any unpublished manuscript in the world, and eventually complete lists of all scientific and other literature, can be made available to any research worker in the world, at low cost and in form for his own permanent possession. This is practicable through the use of microfilm, declared Watson Davis, president of the American Documentation Institute and director of Science Service, at the World Congress of Universal Documentation. Mr. Davis is chairman of the American delegation to this meeting.

Microfilms are copies of book pages, manuscript sheets, illustrations, etc., as separate "frames" on a continuous strip of film the size of standard movie film or smaller. A complete copy of a large book made in this way can be carried in the corner of a pocket, and mailed anywhere in the world for a few cents. They can be read with the aid of small hand-size lens-holders, or more easily through the use of special projection machines about the size of standard typewriters.

Library In Small Space

Thus a scholar can have a permanent library covering his whole subject and comprising the rarest works in the world, even though he does all his work in a single small room.

Auxiliary publication of long works, and other specialized material too expensive to print for the limited circulation they would receive, is also possible through microfilm. Mr. Davis pointed out some of its advantages:

"It will supplement other forms of publication and make accessible material of all sorts that can not now be printed because of economic factors. It will make available valuable research data that now go unrecorded. It will make available out-of-print and rare books. It is adapted to the publication of photographs and other illustrations. Auxiliary publication service (which might be named Docufilm Service) should be auxiliary to established channels of scholarly publication and it should aid and

not hinder journals. Editors of journals and institutions should act as intermediaries between the authors of papers and the 'Docufilm Service.'

"This idea has been given an experimental demonstration in America in connection principally with scientific papers. There a journal editor can publish as much or as little of a technical paper as he wishes. In the case of a very specialized paper it may be only an abstract or summary. He appends to the notice or article a note saying that the full article with diagrams, pictures, etc., can be obtained by remitting a certain price and specifying the document number under which this full article has been deposited at the central agency operating the auxiliary publication service. Orders are sent by readers directly to this central agency, which is the American Documentation Institute at Washington, D. C. Microfilms of the document are made only if and when ordered.

"In this way the document is perpetually 'in print' but no extensive, space-consuming stocks need be stored, only the document itself and the microfilm negative from which positives are made for distribution. The operation of the plan is simple and uncomplicated and editors may use it when, how and if they find it helpful. No financial participation or guarantees on the part of the editor or author are required.

"It is believed that this or analogous techniques can be adopted in other countries, preferably with central agencies serving those countries. If this is done there can be effective exchange of negatives between 'Docufilm centers'."

For News Files

Newspaper files, that now take up costly space by the cubic yard in newspaper offices and public libraries, can be squeezed down until a single filing case will hold the issues of many years, through the use of microfilm.

The proposal to save space, and at the same time make the records safe against the inevitable crumbling of wood-pulp

print paper, was put forth by Mr. Davis, speaking before the World Congress. Mr. Davis said, in part:

"The volume of the daily production of newspapers of the world is stupendous. In one sense, the daily newspaper is a very ephemeral product. Nothing is staler than yesterday's issue. In another sense, the daily newspaper is a fundamental historical document. Often no other written record is closer to an event. Each issue is a complex installment of the world's continued story, which is never finished.

"The mere physical volume of files of newspapers prevents them from being maintained and stored as they should be. Only a fraction of the newspapers of America, for example, are filed in the libraries of the cities in which they are issued. The wood-pulp paper on which they are printed is perishable and some of it disintegrates after two or three decades.

"Here is a major job for microfilm. Only through the medium of microfilming does there seem to be any hope of preserving the daily newspaper record of the world.

"Happily for all documentation, and especially for newspaper preservation, research has shown that microfilm that is cellulose acetate, or 'safety' film, is chemically more stable than good rag record paper, which means it should last at least 100 to 200 years. Thus, microfilming is an act of preservation."

Science News Letter, August 21, 1937

GEOLOGY

Arctic Canada Had Gold Rush in 16th Century

GOLD rushes renewing themselves in the Arctic, scientists flying to the Pole and announcing that they intend to stay there for a year, give timely point to an old story revived by a new scientific publication of the Field Museum of Natural History, Chicago, written by Sharat K. Roy, curator of geology.

It is about the first stuff pertaining to be gold ore brought back from the American Arctic. It launched the first gold rush and the first gold mining boom. It cost many nervy men their lives, and many "suckers" their money. And now, after more than three centuries, Mr. Roy finds out that the "gold" was not even fools' gold or pyrites, but brassy yellow mica, veined in some black rocks.

In 1576, Capt. Martin Frobisher, after a successful career in piracy (broadly

winked at by his honored sovereign, Queen Elizabeth), set out from England with two small vessels to find a route around the northern end of North America. It was the first of many efforts to navigate the famed Northwest Passage.

Captain Frobisher did not discover the hoped-for route to Cathay, but he did get well up into the Arctic and made noteworthy explorations among the islands between Canada and Greenland.

Upon his return, the wife of one of his sailors put a coal-like piece of rock her husband had brought with him on the fire, to see if it would burn. It refused to burn, but oozed out a few globules of yellow stuff that looked like gold.

That started it. Cautious reports of reputable goldsmiths, that there was no gold in the rock, were ignored when one adventurous alchemist declared that he really had found gold in it. Frobisher's principal financial backer, one Michael Lock, organized a stock company. The queen herself subscribed for one-fourth of the shares.

Import "Ore"

The cargo brought back from a second voyage, 200 tons of the "ore," was kept securely under lock and key in the dungeons of Bristol Castle. A third voyage, with a whole fleet of ships, brought back 1,300 tons of the "ore." But by then the bubble had burst; the stuff was known to be worthless. Michael Lock was ruined, bankrupt, jailed. Frobisher was acquitted by the queen, afterwards proving his worth in the Armada battle, when with one small ship he whipped four vastly bigger Spanish galleons. He finally died of a wound received in later fighting against the Spaniards.

Remains of Frobisher's diggings are still to be seen on Countess of Warwick Island, with the ruins of a stone house he had erected there on his last voyage. Specimens of the 1,300 tons of "ore" dumped as worthless in Dartford have also been recovered in recent diggings. Petrographic examination shows the "gold" to consist merely of veins of brassy-colored mica.

Science News Letter, August 21, 1937

A water sleigh designed by Soviet scientists for use in the Arctic is equipped with a 100 horsepower motor, steered by an air rudder, and run on skis, and can be used over water, ice floes, or snow.

BIOLOGY

Sex Found in One-Celled Animal Considered Sexless

Paramecium Found to Pair and Mate and Inherit Sex By Mendelian Laws in Same Way as Does Man

SEX has been discovered in Paramecium.

For decades, this one-celled animal has been the classical example of sexless mating. Dr. Tracy M. Sonneborn, associate in zoology at the Johns Hopkins University, has reported this discovery, (*Proceedings of the National Academy of Sciences*). A new approach to the study of the origin and nature of sex has been made.

Occasional mating in such minute unicellular animal organisms has been observed for many years, but there was no indication of sexual difference until the experiments of Dr. Sonneborn.

Two of the five races of Paramecium explained by Dr. Sonneborn have shown sex differences, and have exhibited a mating process fundamentally the same as that known in higher life.

The actual presence of individuals of opposite sex, under favorable conditions, has apparently been found to be the only requirement for inducing an instantaneous sexual reaction. Dr. Sonneborn reports, too, that sex is inherited and determined in much the same way as that of man and of higher life in general, and is similarly governed by the Mendelian laws of heredity.

Placing the study of the genetics of unicellular animals on a "quantitative and predictable" plane for the first time, Dr. Sonneborn estimated that his discovery, which brings with it perfect control of mating and a consequent certainty of rapidly acquiring a knowledge of the genetics of Paramecium, "should lead rapidly into a systematic, coherent body of knowledge in close touch with the rest of genetic science."

The discovery will open wide the field for the study of heredity in unicellular animals, which comprise a large portion of the animal kingdom.

In the Paramecium, a small oval-shaped animal, approximately one two-hundred-fiftieth of an inch in length and about one-third as wide, often found in stagnant waters, reproduction is known to take place by a simple division of the parent body. Occasional conjugation oc-

curs in the temporary union of two individual cells. In the process, complicated divisions of the central portions, or nuclei, of the Paramecia occur, there is an exchange of nuclear particles, and the Paramecia separate again.

Despite the resemblance to true sexual reproduction, biologists long held conjugation to be an example of sexless mating.

Dr. Sonneborn's discovery of two distinct sexes each of which will conjugate only with members of the opposite sex, followed in the course of his study of endomixis, a process similar to conjugation, but lacking fertilization.

He found that after this process, "in certain cases the numerous descendants of a single individual that has undergone endomixis will not conjugate together, but they will under the same conditions conjugate with descendants of certain other exendomitic individuals. Following this clue, the entire stock was found divisible into two sex classes."

The original work was done with a "Race S" of Paramecium, found in a pond at Cold Spring Harbor, Long Island.

Dr. Sonneborn found that cultures derived directly from certain individuals would, on mixture, immediately form clusters, growing large enough to include all the individuals, and finally disintegrating into normally conjugated pairs. Pairing off a group of such cultures into all possible combinations, Dr. Sonneborn was able to divide them into two sexually different groups, the same in all visible aspects. The clusters produced by combining cultures of the sexes persist about one hour.

"Within the clusters readjustments of position occur slowly," Dr. Sonneborn reports, "until pairs achieve the position appropriate for conjugation. In this position, nearly all the oral side of the body is in contact with the mate . . . Each properly oriented pair is automatically released from the cluster."

"Cluster formation and pairing are seemingly not due," his report continues, "to the action of certain substances in

the fluid in which the two sexes are growing."

A study of the habits of the organisms over a period of three months showed that the normal sex reaction will not take place at certain times in the life history, notably during the first week following conjugation, during endomixis, and whenever the animal is overfed.

Dr. Sonneborn found that in cases of reproduction by division, sex is invariably inherited from the parent; while in cases in which conjugation or endo-

mixis has intervened, inheritance is determined strictly according to the Mendelian laws which govern inheritance of sex in man. Thus, the examination of several thousands of individuals has shown that the distribution of the sexes is purely a matter of chance.

As in the case of most other organisms, Dr. Sonneborn reports, "it is evident that the method of inheritance indicates that sex determination is nuclear."

Science News Letter, August 21, 1937

PHYSICS

Mythical Gun That Aims Itself Seems Impossible to Silence

THAT ever-booming perennial, the gun that aims itself, has been getting into the papers again. The experts who know all about artillery because they can make a newspaper typewriter work (admittedly no mean feat!) tell us that somewhere on the deck will be a listening device, that will catch the distant sound of the approaching bomber's motors, even though the plane is hidden in night or fog. With no more than this to go on, the marvelous robot machinery of the guns will swing them around until their muzzles point squarely at the unseen foe. Boom! (or Bang!, if you prefer), and the enemy nosedives for Davy Jones's Locker.

It avails Navy ordnance men nothing to deny, even with curses and almost with tears, that such a device exists. They are only given credit for discretion and zeal in guarding the secrets of our nation's defenses. The whole legend of the gun that aims itself is a beautiful example of how a naive will-to-believe

can make even the most improbable legend puncture-proof.

An elementary knowledge of the physics of sound will show how difficult it is to get even an approximate idea of where a thing is merely by the noise it makes.

Sound, as everybody knows, consists of rapidly moving compression waves in air. When air moves, it dislocates and distorts the sound. We have all had experience with that, when we try to shout something to a companion on the other side of a field when a strong wind is blowing. The wind carries away our voices, we say. That is even scientifically correct.

The giant grotesque ear-trumpet-like things used by the Army to listen for approaching planes increase the range of the ear as field-glasses aid the eye. But they can be fooled. There may be two, three, or more quite independent winds blowing in the upper air, between them and the object of their search. There may

be strata of different density, which change the speed of sound. In mountainous country, there will be confusing echoes.

With all these factors, and others besides, to shift the sound hither and yon, a sound-detector is doing well enough if it can give the widest kind of a blunderbuss location for the oncoming plane. It is then up to the searchlights to spot it, the rangefinders to estimate height and distance, and the gunlayers to get the cross-hairs of their sights on it.

Then, with all the skill they can muster, and a dab of cannoneers' luck to help out, they may score a hit. Othello's occupation is far from gone, in the A.A. artillery, at least.

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PHYSICS

Accelerated Weathering Tests Building Materials

ACCELERATED aging tests that include changes in temperature, humidity and light are part of the program of research which the National Bureau of Standards is applying to fibrous building materials like insulating and wall boards for both exterior and interior uses and sheathing papers. Part of the fund given to the Bureau for a general study of building material relative to low-cost housing projects, is financing the research.

The effects of serious artificial weather changes will be studied to see how they create distortion, expansion and contraction, cause mold growth, vary the moisture resistance and decrease the strength of the materials. Two research scientists have been added to the staff for this project which should supply information that will permit the house builder to make an intelligent choice between different types of materials and determine whether he can profitably substitute some of them for more expensive materials.

Science News Letter, August 21, 1937

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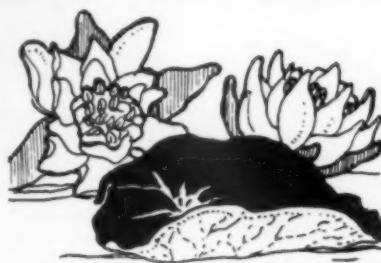
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ECOLOGY

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by Frank Thone



"Slime of the Earth"

MORALISTS like to make a parable of the waterlily. Behold, they tell us, how it is rooted in slimy black mud at the bottom of the pond, yet how beautiful is the flower that turns its face up toward the sky!

A cynic or a pessimist might invert the tale, and point out how all that white beauty, all the glistening green of the broad leaves, are surely destined to die and decay and themselves be added to the black muck at the bottom. Slime of the earth they are, and unto slime of the earth they must return.

The philosophical naturalist, of course, sees both phases as complementary parts of the same cycle. A German poet long ago summed it up: "All things go to their end, and the end holds the germs of beginning." So the water plants sink and become muck—with the seeds of the next generation nestling in them for nourishment.

The cycle of decay, growth, again decay, new growth, is an advancing cycle. Year by year the drowned humus piles deeper on the bottom, ever fed by dead leaves, dead flowers, dead bodies of all manner of small water animals. Year by year the circle of open water becomes smaller, its depth less.

When a newly formed pond in an open basin turns first into a bog, then into solid earth, the process goes through a regular succession of stages, in each of which the aquatic and wet-land plants play certain regular roles.

At the margins, plants like arrowleaf and cattails grow, with lotus and buttonbush a little farther out, where the bases of their stems are always submerged. As they die and add their bodies to the soil, they raise the level of the shore ever so little, push it ever so little toward open water.

In the water itself grow the water-lilies and other long-stemmed, bottom-rooted aquatics, and beyond the depth for even these are unrooted, floating plants like duckweed, water buttercup and bladderwort. These slowly raise the level of the bottom, preparing the way for further advance of the shore vegetation.

Among the bases of the larger plants along the wet margin are many smaller growths, particularly masses of sphag-

num moss, which adds a tremendous bulk to the total. Often this moss mat grows so fast that it forms a projecting shelf over part of the water, or even closes over the open pond completely, leaving a liquid core hidden beneath. In this stage we have a "quaking" bog.

Finally, however, the last of the water is filled up with dead plant parts, the bog becomes solid, is invaded by bushes and trees, and in the course of many centuries becomes firm, flat land.

Science News Letter, August 21, 1937

CHEMISTRY

Modern Chemistry Finds Why Greeks Prized Famous Spring

MODERN chemistry has analyzed a sample of water from the fountain of Peirene at Corinth, revealing that the Greeks had reason to set store by this famous spring.

Ancient Greeks held that the water would improve bronze immersed in it hot. Dr. Earle R. Caley of Princeton University, who analyzed the water, finds that it contains unusually high amounts of potassium, chloride, and silica. The water in evaporating gives a residue that absorbs moisture, due to presence of hydrous chlorides, somewhat as ordinary table salt would absorb moisture in wet weather.

These facts, he pointed out, "might explain why the bronze objects anciently made at Corinth were treated with this water, for bronze with such a saline residue left on the surface would tend more rapidly to acquire a pleasing green patina than bronze not so treated."

Dr. Caley's investigation was made at the new chemical laboratory which has been set up in the ruins of the Athenian Agora, or market place, to aid archaeologists working there. The American School of Classical Studies at Athens, which has completed its seventh campaign of digging at the Agora, under leadership of Dr. T. Leslie Shear of Princeton, has now uncovered 18 acres of the 20-acre plot.

One important discovery of this season is a monumental stairway 30 feet wide, leading up the steep northwest pitch to the Acropolis. This stairway was shown on Athenian imperial coins, but it has heretofore been believed that the ancient coin designer was simply distorting his city geography, and was

merely trying to force the well-known front stair into the coin picture.

A large Doric temple, another new discovery, is 119 by 55 feet. It was built in the fifth century B.C. and is identified as the long-sought Temple of Ares, god of war.

Discovery of this temple solves a problem that has worried the excavators. The description of the Athenian market place left by Pausanias was particularly perplexing on this point, as to where the war god's temple stood. It is now cleared up, that Pausanias was not describing buildings of the market place in order all around. Instead, he described the west side, and then backtracked and started on the east side of the area.

Existence of a prehistoric settlement on this ground, at the foot of Athens' citadel, is definitely proved by discoveries this year. Pits and shallow wells have yielded baskets of sherds and many complete vases dating from the late Stone Age, 3000 B.C. and on to 1800 B.C.

Science News Letter, August 21, 1937

German chemists have succeeded in producing a synthetic emerald of fairly large size, but making this gem is slow and expensive.

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Biography

AUDUBON, AN INTIMATE LIFE OF THE AMERICAN WOODSMAN—Stanley Clisby Arthur—*Harmanson, New Orleans*, 517 p., \$5. A scholarly, well-documented biography of the famous ornithologist and artist. It outlines his endless journeys in bold, long strokes, and fills in with careful interlinings of his doings day by day. There are dozens of excellent illustrations, both portraits and bird pictures. Bird-lovers and Audubon-admirers will all want this book.

Science News Letter, August 21, 1937

Economics

CONSUMPTION AND STANDARDS OF LIVING—Carle C. Zimmerman—*Van Noststrand*, 602 p., \$3.75. Comprehensive yet readable, this covers consumption, food, housing, clothing, spending and saving, and a history of research in this field. See page 121.

Science News Letter, August 21, 1937

Economic Geology

GOLD DEPOSITS OF THE WORLD, WITH A SECTION ON PROSPECTING—William Harvey Emmons—*McGraw-Hill*, 562 p., \$6. See page 120.

Science News Letter, August 21, 1937

Economics, Juvenile

MONEY TALKS—Albert Ulmann—*Bruce Humphries*, 159 p., \$2. A sixteen-year-old school boy discusses finance with his father and uncle. Monetary problems, from the days of barter to the present, are explained in readable language.

Science News Letter, August 21, 1937

Psychology

PRIMITIVE INTELLIGENCE AND ENVIRONMENT—S. D. Porteus—*Macmillan*, 325 p., \$3. See page 72, SNL, July 31.

Science News Letter, August 21, 1937

Botany

TEA—Llewelyn Williams—*Field Museum of Natural History*, 30 p., 25 c. All about tea, in very small compass, well told and with good pictures.

Science News Letter, August 21, 1937

Economic History

AN ECONOMIC SURVEY OF ANCIENT ROME, Vol. III: Roman Britain, Roman Spain, Roman Sicily, La Gaule Romaine—R. G. Collingwood, J. J. Van Noststrand, V. M. Scramuzza, and A. Grenier; Ed. by Tenny Frank and others, 664 p., \$4. Describes in detail the industries, resources, educational conditions, and other economic factors in

four western provinces of Rome. The material thus organized should be highly useful for reference to those studying the life of that era from any standpoint.

Science News Letter, August 21, 1937

Botany

USEFUL PLANTS AND DRUGS OF IRAN AND IRAQ—David Hooper—*Field Museum*, 241 p., \$1.50.

Science News Letter, August 21, 1937

Botany

THE NORTH AMERICAN SPECIES OF RUMEX—K. H. Rechninger, Jr.—*Field Museum*, 151 p., illus., \$1.50.

Science News Letter, August 21, 1937

Zoology

NEARCTIC COLEMBOLA OR SPRING-TAILS, OF THE FAMILY ISOTOMIDAE—J. W. Folsom—*Govt. Print. Off.*, 144 p., 30 c. U. S. National Museum Bulletin 168.

Science News Letter, August 21, 1937

Evolution

A STORY OUTLINE OF EVOLUTION—Chas. W. Grimes—*C. V. Hoagland Co., Somerville, New Jersey*, 286 p., \$2. This book sees all cultural development as evolution. To make the story easier for the non-biologist to grasp, "evolutions" of such diverse things as writing, transportation, music, and morals are discussed first, followed in Part II by the story of organic evolution.

Science News Letter, August 21, 1937

Zoology

A SURVEY OF THE RESIDENT GAME AND FURBEARERS OF MISSOURI—Rudolf Bennett and Werner O. Nagel—*Univ. of Missouri*—215 p., \$1.25. One of the best-endowed states in the Union in the matter of wildlife, Missouri has yet some pretty severe problems to face if it is to remain so. At the beginning of every effort to conserve and restore wildlife must be an inventory of what one has. This monograph supplies it in more than adequate fashion.

Science News Letter, August 21, 1937

Education

LET'S READ!—Holland Roberts and Helen Rand—*Holt*, 598 p., \$1.44. A school reader of rather unusual type, compiled from selected magazine articles, most of them on scientific or allied subjects. Questions at chapter-ends are designed to stimulate observation and train in systematic thinking.

Science News Letter, August 21, 1937

Disasters

HUNGRY WATERS—Lowell Thomas—*Winston*, 321 p., \$1.50. The epic of the Great Flood of 1937, told vividly by a master reporter who saw the whole awful spectacle, can grasp it as a tragic entirety, yet is able to pick out and give vivid presentation to significant details. Illustrations, well selected from the best news-picture sources, highlight and emphasize the text. And at the end there is unashamed preaching of sound doctrine on what to do about it.

Science News Letter, August 21, 1937

Botany

FAMILIAR FLOWERS OF FIELD AND GARDEN—F. Schuyler Mathews—*Appleton-Century*, 310 p., \$2.50. A new edition of an attractive and workable popular key to common cultivated and wild species.

Science News Letter, August 21, 1937

Zoology

FUR-BEARING MAMMALS OF CALIFORNIA, THEIR NATURAL HISTORY, SYSTEMATIC STATUS AND RELATIONS TO MAN—Joseph Grinnell, Joseph S. Dixon and Jean M. Linsdale—*Univ. of California*—2 vols., 777 p., 345 illus., \$15. set. Sumptuously gotten up, with many beautifully done color plates, this work is also meticulously accurate from the scientific point of view, and gives full details both of the taxonomy and the natural history of the species treated. It automatically becomes a "must" book for all zoologists, wildlife managers, and persons interested in the fur trade, through the whole Pacific Coast area, and as a reference work elsewhere.

Science News Letter, August 21, 1937

Recreation

GUIDE TO TRAILS AROUND WASHINGTON—Robert Shostek—published by author. Available from Miss R. M. Petta, 1651 Lamont Street, N. W., Washington, D. C., 80 p., maps., 40 c, 50 c postpaid. A guide for hiking parties in the country around the District of Columbia, with incidental notes on natural history features to be seen by the way.

Science News Letter, August 21, 1937

Education

AN EXPERIMENTAL STUDY AT NEW YORK STATE TEACHERS COLLEGE AT BUFFALO TO DETERMINE A SCIENCE PROGRAM FOR THE EDUCATION OF ELEMENTARY CLASSROOM TEACHERS—Anna M. Gemmill—*Teachers College, Columbia Univ.*, 74 p., \$1.60.

Science News Letter, August 21, 1937